

WHAT IS CLAIMED IS:

1. A method for modifying a pre-formed, nonwoven fibrous web, said method comprising the steps of:
 - 5 a. feeding in a web movement direction to a pair of opposed, interengaged forming rolls a substantially untensioned, nonwoven fibrous web having an initial width, an initial thickness, an initial basis weight, an initial low-elongation cross-web extensibility expressed as an initial load to achieve 10% cross-web elongation, an initial intermediate-elongation cross-
10 web extensibility expressed as an initial load to achieve 30% cross-web elongation, an initial cross-web strength, and an initial elongation capability;
 - b. gripping the web between the interengaged forming rolls at a nip defined by the forming rolls, wherein each forming roll includes a
15 plurality of axially spaced, circumferentially extending, alternating radial teeth and intervening grooves, and wherein the teeth of one roll are opposite from and extend into the grooves of the opposed roll;
 - c. modifying the nonwoven web by subjecting the nonwoven web
20 to incremental lateral stretching as the web passes between the interengaged forming rolls and as the rolls rotate in opposite directions, to incrementally stretch the web in a cross-web direction that is substantially perpendicular to the web movement direction and withdrawing the web from between the interengaged forming rolls by applying to the web a tensile
25 withdrawal force that extends in the web movement direction, wherein the resulting modified web has a load to achieve 10% elongation of from about 5% to about 100% of the initial load to achieve 10% elongation, a load to achieve 30% elongation of from about 5% to about 100% of the initial load to achieve 30% elongation, a cross-web strength of from about 10% to
30 about 80% of the initial cross-web strength, and a cross-web elongation capability of from about 105% to about 200% of the initial cross-web elongation capability.
2. A method in accordance with claim 1 wherein the resulting
35 modified web has a web width that is from about 25% to about 300% of the initial web width.

3. A method in accordance with claim 1, wherein the web has an initial web thickness of from about 5 mils to about 20 mils and wherein the resulting modified web has a web thickness that is from about 85% to about 400% of the initial web thickness.
4. A method in accordance with claim 1, wherein the resulting modified web has a thickness which is greater than the initial web thickness, and a modified basis weight which is less than the initial web basis weight.
5. A method in accordance with claim 1 wherein the teeth and grooves of each forming roll are circumferentially continuous.
6. A method in accordance with claim 1, wherein the teeth of at least one of the forming rolls include a plurality of spaced, circumferential recesses.
7. A method in accordance with claim 1, including the additional step of joining the nonwoven web in face-to-face relationship with a polymeric film to form a composite material.
8. A method in accordance with claim 7, wherein the resulting composite material has an MVTR of from about 500 g/m²/24 hr to about 5000 g/m²/24 hr, has a dynamic impact value of less than about 10 g/m², and has an O₂ permeation rate of from about 2 m³O₂/m²/24 hr. to about 20 m³O₂/m²/24 hr.
9. A method in accordance with claim 8, wherein the polymeric film includes an incompatible inorganic material dispersed substantially uniformly therethrough, wherein the inorganic material is selected from the group consisting of calcium carbonate, clay, titanium dioxide, and mixtures thereof.

10. A method in accordance with claim 7, wherein the polymeric film is a breathable, monolithic film, and wherein the resulting composite material has an MVTR of from about 500 g/m²/24 hr to about 5000 g/m²/24 hr and has a dynamic impact value of less than about 10 g/m².

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11. A method for modifying a pre-formed, nonwoven fibrous web, said method comprising the steps of:

10 a. feeding in a web movement direction to a first pair of opposed, interengaged forming rolls a substantially untensioned, nonwoven fibrous web having an initial width, an initial thickness, an initial basis weight, an initial low-elongation cross-web extensibility expressed as an initial load to achieve 10% cross-web elongation, an initial intermediate-elongation cross-web extensibility expressed as an initial load to achieve 30% cross-web
15 elongation, an initial cross-web strength, and an initial elongation capability;

b. gripping the web between the first pair of interengaged forming rolls at a nip defined by the forming rolls, wherein each forming roll includes a plurality of axially spaced, circumferentially extending, alternating radial
20 teeth and intervening grooves, and wherein the teeth of one roll are opposite from and extend into the grooves of the opposed roll;

c. modifying the nonwoven web by subjecting the nonwoven web to incremental lateral stretching as the web passes between the first pair of
25 interengaged forming rolls and as the rolls rotate in opposite directions, to incrementally stretch the web in a cross-web direction that is substantially perpendicular to the web movement direction and withdrawing the web from between the first pair of interengaged forming rolls by applying to the web a tensile withdrawal force that extends in the web movement direction;

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d. feeding in a web movement direction to a second pair of opposed, interengaged forming rolls;

e. gripping the web between the second pair of interengaged forming rolls at a nip defined by the forming rolls, wherein each forming roll includes a plurality of axially spaced, circumferentially extending, alternating radial teeth and intervening grooves, and wherein the teeth of one roll are opposite from and extend into the grooves of the opposed roll;

f. further modifying the nonwoven web by subjecting the nonwoven web to incremental lateral stretching as the web passes between the second pair of interengaged forming rolls and as the rolls rotate in opposite directions, to incrementally stretch the web in a cross-web direction that is substantially perpendicular to the web movement direction and withdrawing the web from between the second pair of interengaged forming rolls by applying to the web a tensile withdrawal force that extends in the web movement direction, wherein the resulting further modified web has a load to achieve 10% elongation of from about 5% to about 100% of the initial load to achieve 10% elongation, a load to achieve 30% elongation of from about 5% to about 100% of the initial load to achieve 30% elongation, a cross-web strength of from about 10% to about 70% of the initial cross-web strength, and a cross-web elongation capability of from about 105% to about 200% of the initial cross-web elongation capability.

12. A method in accordance with claim 11, wherein the forming rolls defining one of the two pairs of forming rolls each have teeth and grooves that are circumferentially continuous, and the teeth of at least one of the forming rolls defining the other pair of the two pairs of forming rolls include a plurality of spaced, circumferential recesses.

13. A method in accordance with claim 11, including the additional step of joining the modified nonwoven web in face-to-face relationship with a polymeric film prior to step e. to form a composite material.

14. A method in accordance with claim 13, wherein the resulting composite material has an MVTR of from about 500 g H₂O/m²/24 hr to about 5000 g H₂O/m²/24 hr, has a dynamic impact value of less than about 10 g/m², and has an O₂ permeation rate of from about 2 m³O₂/m²/24 hr. to about 20 m³O₂/m²/24 hr.

15. A method in accordance with claim 14, wherein the polymeric film includes an incompatible inorganic material dispersed substantially uniformly therethrough, wherein the inorganic material is selected from the group consisting of calcium carbonate, clay, titanium dioxide, and mixtures thereof, and wherein passing the joined modified nonwoven web and polymeric film between the second pair of interengaged forming rolls imparts tensile forces to the film to stretch the polymer matrix and cause localized separation of the thermoplastic polymer from the incompatible material to form micropores in the film.

16. A method in accordance with claim 13, wherein the polymeric film is a breathable, monolithic film and wherein the resulting composite material has an MVTR of from about 500 g H₂O/m²/24 hr to about 5000 g H₂O/m²/24 hr and has a dynamic impact value of less than about 10 g/m².

17. A method for forming a composite elastic material having a modified nonwoven component and an elastic component, said method comprising the steps of:

a. feeding in a web movement direction to a first pair of opposed, interengaged forming rolls a substantially untensioned, preformed, nonwoven fibrous web having an initial elongation capability;

b. gripping the web between the first pair of interengaged forming rolls at a nip defined by the forming rolls, wherein each forming roll includes a plurality of axially spaced, circumferentially extending, alternating radial teeth and intervening grooves, and wherein the teeth of one roll are opposite from and extend into the grooves of the opposed roll;

c. modifying the nonwoven web by subjecting the nonwoven web to incremental lateral stretching as the web passes between the first pair of interengaged forming rolls and as the rolls rotate in opposite directions, to incrementally stretch the web in a cross-web direction that is substantially perpendicular to the web movement direction and withdrawing the web from between the first pair of interengaged forming rolls by applying to the web a tensile withdrawal force that extends in the web movement direction,

wherein the modified web has a cross-web elongation capability of from about 50% to about 200% of the initial cross-web elongation capability;

5 d. joining an elastic web to the modified nonwoven web to form a composite elastic material.

18. A method in accordance with claim 17, wherein the force-to-elongate the resulting composite elastic material at extensions between about 50% and 200% is less than about 40% greater than the force-to-elongate the elastic web alone at extensions between about 50% and 200%.

19. A method in accordance with claim 18, wherein the force-to-elongate the resulting composite elastic material at extensions between about 50% and 200% is less than about 600 g/in.

20. A method in accordance with claim 17, wherein the resulting composite elastic material is breathable.

21. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet, wherein the article includes a component having as an element thereof a nonwoven web that has been modified in accordance with the method set forth in claim 1.

22. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet, wherein the backsheet of the article includes a composite material made in accordance with the method set forth in claim 8.

23. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer

when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet, wherein the backsheet of the article includes a composite material made in accordance with the method set forth in claim 10.

24. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet, wherein the article includes a component having as an element thereof a nonwoven web that has been further modified in accordance with the method set forth in claim 11.

25. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet, wherein the backsheet of the article includes a composite material made in accordance with the method set forth in claim 14.

25. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet, wherein the backsheet of the article includes a composite material made in accordance with the method set forth in claim 14.

26. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and an absorbent core positioned between the topsheet and the backsheet,

wherein the backsheet of the article includes a composite material made in accordance with the method set forth in claim 16.

27. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and a absorbent core positioned between the topsheet and the backsheet, wherein the article includes a component having as an element thereof a composite elastic material that has been made in accordance with the method set forth in claim 17.

28. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and a absorbent core positioned between the topsheet and the backsheet, wherein the article includes a component having as an element thereof a composite elastic material that has been made in accordance with the method set forth in claim 18.

29. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and a absorbent core positioned between the topsheet and the backsheet, wherein the article includes a component having as an element thereof a composite elastic material that has been made in accordance with the method set forth in claim 19.

30. A disposable absorbent article that is adapted to be worn, the article including a fluid-pervious topsheet that faces the body of the wearer when the article is worn, a substantially liquid-impervious backsheet that faces away from the body of the wearer when the article is worn, and a absorbent core positioned between the topsheet and the backsheet, wherein the article includes a component having as an element thereof a composite elastic

Year	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	